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Provincial Differences in Labour Force Participation

BY SYLVIA OSTRY



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Provincial Differences
in Labour Force Participation

by
Sylvia Ostry

ONE OF A SERIES OF LABOUR FORCE STUDIES
in the
1961 CENSUS MONOGRAPH PROGRAMME

DOMINION BUREAU OF STATISTICS
OTTAWA, CANADA
1968

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Foreword

The Canadian Censuses constitute a rich source of information about individuals and their families, extending over many years. The census data are used widely but it has proved to be worthwhile in Canada, as in some other countries, to supplement census statistical reports with analytical monographs on a number of selected topics. The 1931 Census was the basis of several valuable monographs but, for various reasons, it was impossible to follow this precedent with a similar programme until 1961. Moreover, the 1961 Census had two novel features. In the first place, it provided much new and more detailed data, particularly in such fields as income, internal migration and fertility, and secondly, the use of an electronic computer made possible a great variety of tabulations on which more penetrating analytical studies could be based.

The purpose of the 1961 Census Monograph Programme is to provide a broad analysis of social and economic phenomena in Canada. Although the monographs concentrate on the results of the 1961 Census, they are supplemented by data from previous censuses and by statistical material from other sources. The present Study is one in a Series on the Canadian labour force. In addition to these Labour Force Studies, monographs will be published on marketing, agriculture, education, fertility, urban development, income, immigration, and internal migration.

I should like to express my appreciation to the universities that have made it possible for members of their staff to contribute to this Programme, to authors within the Dominion Bureau of Statistics who have put forth extra effort in preparing their studies, and to a number of other members of DBS staff who have given assistance. The Census Monograph Programme is considered desirable not only because the analysis by the authors throws light on particular topics but also because it provides insight into the adequacy of existing data and guidance in planning the content and tabulation programmes of future censuses. Valuable help in designing the Programme was received from a committee of Government officials and university professors. In addition, thanks are extended to the various readers, experts in their fields, whose comments were of considerable assistance to the authors.

Although the monographs have been prepared at the request of and published by the Dominion Bureau of Statistics, responsibility for the analyses and conclusions is that of the individual authors.

Harold G. Duffett.

DOMINION STATISTICIAN.

Preface

This is one in a series of studies dealing with selected aspects of the labour force in Canada as revealed, in the main, by the 1961 and earlier Censuses. The present study seeks to expose the extent and nature of interprovincial variation in labour force participation in this country. Within the limitations imposed by data availability, an attempt is made to distinguish the influence of "structural" (demographic) factors from behavioural differences in labour force activity. The study focuses on the 1961 situation although some limited historical analysis is also included.

The author wishes to thank members of the Census Division, in particular Mrs. Amy Kempster, for co-operation and assistance in providing data. Appreciation is also extended to Professor J.D. Allingham (University of Western Ontario and Australian National University) for helpful comments and criticism, and to Mr. N.H.W. Davis of the Dominion Bureau of Statistics for preparing the regression results given in the Appendix. The usual observation with respect to the author's responsibility for error, of course, applies.

Sylvia Ostry,
*Director, Special Manpower Studies and
Consultation, DBS*

OTTAWA, 1968



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1. Introduction

At any given time there are differences in labour force participation across this country: the all-Canada participation rate conceals a good deal of interprovincial variation. These differences in provincial labour force membership, in part, reflect differences in the economic and social environment of the provinces which influence the labour force behaviour of the population and, in part, are the consequence of differing population compositions among the provinces. The purpose of the present Study is simply to expose the extent of geographic (interprovincial) variation in labour force participation in Canada in 1961 and to trace some of the historical changes that have occurred in respect to this phenomenon. Data for Yukon Territory and the Northwest Territories are excluded throughout.

2. *Interprovincial Differences: Selected Specific Participation Rates*

As Table 1 demonstrates, the proportion of provincial populations with labour force attachment at the date of the 1961 Census varied from a low of just under 43 per cent in Newfoundland to a high of 57 per cent in Alberta, a total range of over 14 percentage points.¹ The total range, depending as it does on the extreme cases, is not the most useful measure of geographic variation in participation. The average absolute (percentage point) deviation (disregarding sign) of the provincial rates from the Canada rate, which is the weighted average of the provincial rates, may be used as a simple and direct measure of geographic variation.² Expressing this absolute deviation as a percentage of the relevant Canada rate facilitates comparison among different component groups in the labour force at any given time or comparisons of the changing variation over time. This relative deviation will be the chief measure of variation used in this Study.

As Table 1 shows, the average deviation of provincial rates from the Canada rate was 3.6 percentage points which was 6.7 per cent of the overall labour force participation rate in Canada. This is the most general measure of interprovincial variation and, as already mentioned, reflects interprovincial differences in both population *behaviour* and in population *structure*. As a first step in exploring these differences, it is useful to examine the variation in participation of selected component groups in the population. Ideally, if it were possible to select completely homogeneous population groups—homogeneous, that is, in terms of their demographic characteristics—this would enable us to expose the extent of variation in labour force propensity or behaviour. But it is impossible, within the range of data available, to isolate all the population segments for which

¹ The Yukon Territory and the Northwest Territories are excluded from this analysis for reasons of comparability with earlier data. It is of interest to note that the participation rate of the Yukon was 67.0 per cent in 1961, the highest of any region in Canada; that of the Northwest Territories, on the other hand, was 54.2 per cent, close to the Canadian average. When standardized on the basis of the all-Canada age-sex composition (22 age-sex groups) the rate for the Yukon reduces to 58.6 per cent and that of the Northwest Territories to 45.8 per cent. Thus the age-sex composition of the population in these areas, especially in the Yukon, is highly "favourable" to over-all participation.

² For extensive use of this measure in regional analysis see Simon Kuznets, Ann Ratner Miller and Richard A. Easterlin, *Population Redistribution and Economic Change*, Vol. II, (Philadelphia, 1960).

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participation rates differ significantly. What follows is admittedly only an approximation to the ideal, but none the less useful in revealing something of the extent of interprovincial variation in labour force tendencies.

Table 1 – Participation Rates by Sex, Canada and the Provinces, 1961

Province or item	Both sexes	Males	Females
Canada	54.0	78.1	29.7
Newfoundland	42.7	65.3	18.6
Prince Edward Island	51.3	76.5	24.9
Nova Scotia	49.7	74.0	24.8
New Brunswick	48.5	71.6	25.1
Quebec	52.5	77.3	28.1
Ontario	56.9	81.1	32.9
Manitoba	55.3	78.4	31.7
Saskatchewan	53.5	78.3	26.6
Alberta	57.0	80.9	31.0
British Columbia	51.9	74.5	28.6
Average absolute deviation	3.6	3.6	3.8
Average percentage deviation	6.7	4.6	12.8

SEX

The simplest disaggregation of the total population relevant to a discussion of labour force participation is that of sex: the labour force activity of males and females differs significantly and consistently and so does the extent of geographic variation in this participation. Although the measure of absolute interprovincial deviation for males is 3.6 and that for females is only slightly higher at 3.8¹, the contrast in the relative measures is very striking, the index for females being almost three times as high as that for males. This much higher relative measure for the females is, of course, a consequence of the lower over-all labour force participation rate of women. In the following analysis concentration is mainly on the relative measure of deviation, since it brings out more clearly many of the comparisons that appear more meaningful in the present context.² However,

¹ The fact that male participation rates for certain age groups are very high – often close to 100 per cent – means that the range of possible variation in an upward direction is limited.

² An analysis based on absolute measures would not likely lead to markedly different conclusions. For males, there is a significant positive correlation (Spearman rank coefficient) between absolute and percentage deviation. For females, however, the correlation, though positive, is not significant at the 5-per cent level. This analysis was based on the maximum number of component groups, i.e., 36 for each sex. (See Table 5 for detail of groups.) For all lesser numbers of component groups the correlation was positive and significant for both males and females.

it must be remembered that for groups with extremely low participation rates the relative measure must be regarded with caution and no precise significance should be attached to particular levels. The absolute measures are provided in Tables 3, 4 and 5 together with the relative measures.

SEX AND AGE

In Table 2 are presented the absolute and relative measures of deviation for age-sex specific provincial participation rates. These come closer to measuring differences in labour force behaviour among the provinces than do the sex-specific measures. As may be seen, although there are wide interprovincial differences in the participation rates of the very young male, by the time he has reached the age of 20 his labour force behaviour does not vary to any great degree from province to province. Greater interprovincial variation in male participation begins to show up again in the older age categories, being especially marked, in the relative measures, over the age of 65.

Table 2 – Average Deviation of Provincial Participation Rates from Canada Rates, by Age and Sex, 1961

Age group	Average absolute deviation		Average percentage deviation	
	Males	Females	Males	Females
15	4.4	1.1	35.5	16.9
16-17	4.3	3.9	12.4	14.2
18-19	3.5	5.8	5.3	10.0
20-24	2.6	4.6	3.0	9.3
25-34	2.5	4.4	2.7	14.9
35-44	2.9	5.5	3.1	17.7
45-54	3.4	5.5	3.7	16.5
55-59	4.3	4.0	5.0	14.3
60-64	5.6	2.8	7.4	13.8
65-69	6.9	2.0	14.5	16.7
70 and over	4.0	0.8	22.3	20.5
15 and over	3.6	3.8	4.6	12.8

The age-specific pattern of geographic variation of female participation rates is somewhat different from that of males. Confining attention to the relative measure, Table 2 reveals that it is high for the very young—the 15-, 16- and 17-year-olds—and then declines somewhat for women in their late teens and early twenties. In contrast to the male picture, however, the

amount of interprovincial variation in participation increases again and remains high for females in the "middle" age groups which are heavily weighted with married women. Finally, very wide interprovincial differences in participation, relative to the average participation rate, characterize the older women although, as Table 2 shows, the absolute index declines very abruptly after the age of 69 and the high relative measure reflects the low labour force membership of this group. In general, the relative measures of deviation are fairly substantial for women of all ages and there is far less contrast in these measures for different age groups than there is for men. However, a stronger age-specific pattern is revealed, as will be seen, when the female population is analysed by marital status.

SEX AND AGE AND MARITAL STATUS¹

Disregarding age for the moment, as Table 3 (last line) shows, there are substantial differences in the extent of interprovincial variation in participation (measured in relative terms) by marital status category and the pattern of these differences is sharply contrasted for men and women. Thus the labour force activity of married men is much less variable provincially than is that of either single or widowed or divorced males. The reverse is true for women; the relative deviation measure for single women is far lower than that for the other two groups.

Dealing with males first, it is apparent from Table 3 that the above observations concerning marital status hold true for each age group; i.e., at any age, there is much less interprovincial variation in the labour force behaviour of married than single or other men. Further, within the single and married category, the "age pattern" of variation observed in Table 1 is readily apparent; the interprovincial differences in labour force participation rates are much wider for the youngest and older males than for those in the "middle" age groups.² Indeed, as may be seen more clearly from Table 3 than Table 1, for males between the ages of 20 and 34 who are married, there is a virtual uniformity³ of labour force behaviour from province to province and even up to the age of 54 there is very little interprovincial

¹ Labour force participation is significantly associated with marital status in the case of both men and women. (See Appendix). For the latter, however, information on an additional demographic characteristic — presence of dependent children — would be most valuable in permitting isolation of more homogeneous population groups. Unfortunately this cross-classification detail is not available.

² The different age pattern revealed in Table 3 for the widowed and divorced category may or may not be real; there are very few males in the widowed and divorced category, especially in the smaller provinces, and the possibility of erroneous enumeration is strong.

³ Isolating urban males in this group would undoubtedly push these indexes down even further. See Tables 4 and 5.

**Table 3 – Average Deviation of Provincial Participation Rates
from Canada Rates, by Age, Marital Status and Sex, 1961**

Age group	Males			Females		
	Single	Married	Widowed and divorced	Single	Married	Widowed and divorced
Average absolute deviation						
15-19.....	4.0	3.9	3.3	4.8	6.7	8.8
20-24.....	3.0	1.5	6.1	2.4	6.0	8.4
25-34.....	4.4	1.7	6.0	5.9	4.6	11.4
35-44.....	5.8	2.3	3.5	6.5	5.9	10.0
45-54.....	7.0	3.0	3.5	7.5	5.5	8.9
55-64.....	7.1	4.5	5.8	6.3	3.1	5.4
65 and over	4.4	5.4	3.0	4.2	0.7	1.0
15 and over	4.5	3.2	3.5	5.3	4.8	5.2
Average percentage deviation						
15-19.....	9.7	4.8	7.0	13.6	27.1	19.0
20-24.....	3.6	1.6	7.2	2.9	21.9	13.7
25-34.....	5.1	1.8	6.9	7.3	21.4	18.7
35-44.....	7.0	2.4	4.0	8.4	23.4	16.6
45-54.....	9.1	3.2	4.1	10.3	20.8	16.1
55-64.....	10.8	5.3	8.1	10.4	19.2	15.8
65 and over	19.1	16.4	18.8	19.1	17.9	17.3
15 and over	7.1	3.7	9.0	9.7	21.8	22.6

variation in the participation rates of married men.¹ On the other hand, the labour force behaviour of the single male of whatever age (except the early 20s) is surprisingly variable from province to province. The contrast between the labour force behaviour of the married and single male in this respect is brought out even more strikingly when it is seen, from the data in Table 3, that the indexes of relative interprovincial deviation for single *males* are only marginally lower, in most age categories, than those for single *females*; indeed, for the age group 20-24 the labour force behaviour of the single male is *more* variable from province to province than is that of

¹ Seymour Wolfbein, among many others, has noted the fact that married men have a higher rate of labour market activity than single men at every age level and attributes this in part "to the fact that family responsibilities require this activity" but also suggests that "the lower labour market activity of single men in the adult age groups may be due to factors of disability affecting both employability and marriageability". *Employment and Unemployment in the United States* (Chicago, 1964), p. 134. These remarks are also relevant in the present context.

the single woman. (Table 3 shows this to be true for the absolute measures as well.) Clearly the generalization, which emerged from the more aggregated data, that the labour force participation rates of women exhibit much greater geographic variation than do those of men is not entirely valid. The labour force behaviour of single men and of single women, in the context of this analysis, is remarkably similar. Further, it might be noted that the absence of a clear "age pattern" in the extent of geographic variation of female participation remarked on above does not hold true for single women.

Turning now to the married female population, it is apparent from Table 3 that there are wide interprovincial differences in their labour force tendencies at all ages (measured in relative terms). However, although the "age pattern" is not a strong one, there is a small reduction in the deviation indexes for the older age groups—a reversal of what has come to be regarded as a "usual" or "normal" age pattern in this analysis. Finally, as may be observed from Table 3, the extent of relative interprovincial variation in the labour force activity of the widowed and divorced group of women is intermediate, for each age category, between that of the other two groups. However, the absolute deviation measures are higher for widowed and divorced than for married women; the lower relative measures reflect higher labour force participation among these women.

SEX AND AGE AND RURAL-URBAN RESIDENCE¹

A fourth demographic characteristic significantly associated with labour force participation is rural-urban residence (see Appendix). Ideally, the data should be cross-classified by all four characteristics in maximum detail in order to isolate the most nearly homogeneous population segments but such data were not available. In the next section participation rates by sex, marital status and residence for four age categories will be analysed but the age groups are so broad as to mask some important differences in geographic variation. Hence in this section sex-age-residence-specific participation rates will be analysed first since these data provide more age detail.

As Table 4 (last line) reveals, the relative interprovincial deviation indexes differ for each residence group, being lowest for the urban male and female labour force and highest for rural-farm males and females.

¹ Rural-urban residence is usually classed as a demographic characteristic. (See, for example, three standard books: John D. Durand, *The Labor Force in the United States, 1890-1960* (New York, 1948); Gertrude Bancroft, *The American Labor Force* (New York, 1958); Clarence D. Long, *The Labor Force Under Changing Income and Employment* (Princeton, 1958). But a case can be made that it is also an economic characteristic, relating to occupational, industrial and class of worker composition.

Undoubtedly an even finer breakdown—by size of city, for example, within the urban population segment—would reveal further differences. But it appears from these data (and, it should be noted, from the absolute measures in Table 4) that there is more geographic variation in the labour force behaviour of the rural than the urban population in Canada.

Table 4 – Average Deviation of Provincial Participation Rates from Canada Rates, by Age, Residence and Sex, 1961

Age group	Males			Females		
	Rural farm	Rural non-farm	Urban	Rural farm	Rural non-farm	Urban
Average absolute deviation						
15-19.....	6.7	2.8	3.5	3.7	3.6	2.8
20-24.....	5.0	3.1	2.2	6.6	3.4	2.6
25-34.....	5.4	3.2	1.6	3.5	2.3	3.2
35-44.....	4.4	3.4	1.6	4.2	4.5	5.0
45-54.....	4.7	3.8	1.8	4.0	5.2	5.5
55-64.....	6.0	4.1	2.3	3.4	2.8	3.7
65 and over.....	7.9	2.9	3.1	1.7	0.8	1.4
15 and over.....	6.4	3.3	2.6	2.9	2.0	2.8
Average percentage deviation						
15-19.....	12.8	7.4	8.7	18.2	15.0	6.9
20-24.....	5.7	3.7	2.5	16.6	11.2	4.8
25-34.....	5.8	3.6	1.7	15.4	12.7	9.7
35-44.....	4.6	3.8	1.7	18.1	20.6	14.7
45-54.....	5.0	4.5	1.9	16.6	20.5	15.1
55-64.....	6.6	5.8	2.8	17.7	16.1	13.8
65 and over.....	13.0	15.2	12.1	25.9	18.8	19.1
15 and over.....	7.7	4.7	3.3	13.3	10.3	8.5

An examination of the age-specific relative deviation indexes for males in Table 4 shows that the labour force behaviour for prime age (25-44 years) urban males is very nearly uniform from province to province and only the youngest and oldest urban male population exhibit any marked geographic differences in labour force tendencies. This same age pattern in geographic variation is also evident for the other two population groups but

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the extent of provincial variation in labour force participation is substantially higher, at each age,¹ for the rural population, especially for rural farm males.

For females, the contrast among the measures of provincial variation in labour force participation for the rural and urban population is especially marked in the younger age groups. There are, as Table 4 demonstrates, much smaller differences from province to province in the labour force behaviour of urban women under the age of 34 than of the same population groups in rural non-farm and farm areas. The contrast is rather less striking in the other age groups, although, with the exception of the category 65 years and over, the measures are lowest in each age category for the urban female population; this is mainly a consequence of the higher participation rates of urban women (see absolute measures, Table 4). In general, the division of the female population according to residence is a less revealing device for approximating "homogeneous" population segments than it is for males, since marital status is a factor of such dominant importance in influencing and explaining female labour force behaviour. In the next section examination will be made of geographic variation in the labour force behaviour of population groups defined by the same age, sex, residence and marital status characteristics.

SEX, AGE, MARITAL STATUS AND RESIDENCE

In Table 5, the relative deviation indexes are presented for population segments defined by sex, age, marital status and residence. The age categories are broader than those delineated in the previous analysis and therefore probably broader than the age categories for which the extent of interprovincial variation in labour force participation differs significantly. However, despite this limitation in the data, they are useful in bringing out more clearly some aspects of geographic variation in labour force tendencies which were apparent only by implication in the previous analysis.

As already noted, there is very little difference from province to province in the labour force behaviour of prime age males, of married males, or of urban males. As one would expect, then, the specific population segment defined by these three characteristics exhibits the least amount of interprovincial variation in participation rates: from Table 5 it may be seen that the relative deviation index for married urban males aged 25-44 is a

¹ With the exception of males 65 years and over. For this group the index for rural farm males is lower than that for the rural non-farm group and only slightly higher than the urban male index. It should be noted, that many of these older men living in rural farm areas are self employed—farm proprietors—and tend to continue in some kind of employment far longer than do workers in urban industry so that the participation rates are very much higher. The index of absolute deviation for rural farm males 65 and over is much larger than is that for either of the other two residence groups in this age category. (See Table 4.)

**Table 5 - Average Deviation of Provincial Participation Rates from Canada Rates,
by Age, Marital Status, Residence and Sex, 1961**

Sex and age group	Single			Married			Widowed and divorced		
	Rural farm	Rural non-farm	Urban	Rural farm	Rural non-farm	Urban	Rural farm	Rural non-farm	Urban
Average absolute deviation									
Males -									
15-24	6.3	2.9	3.6	4.4	2.7	1.3	9.6	11.9	6.5
25-44	7.2	3.9	4.2	3.6	3.0	1.0	5.6	5.3	2.8
45-64	8.6	5.6	4.5	4.9	3.6	1.6	6.9	3.5	3.3
65 and over	9.0	2.6	3.4	7.7	3.7	3.5	6.4	2.2	2.4
15 and over	9.2	2.7	3.3	5.1	4.1	2.0	7.3	2.3	2.9
Females -									
15-24	5.2	4.1	3.0	4.3	2.6	6.2	19.2	7.2	7.0
25-44	5.9	6.2	3.9	4.4	3.5	5.3	8.9	8.7	8.3
45-64	10.7	8.7	4.2	3.7	4.2	5.3	8.9	5.3	6.1
65 and over	4.4	5.8	5.8	1.5	0.8	0.8	2.4	0.8	1.4
15 and over	4.7	4.2	3.1	3.9	3.2	4.6	6.4	2.7	3.0
Average percentage deviation									
Males -									
15-24	10.1	5.8	6.6	4.7	3.0	1.4	11.1	18.4	8.3
25-44	8.1	5.0	4.9	3.7	3.2	1.0	6.4	6.7	3.2
45-64	10.1	8.7	6.4	5.2	4.4	1.8	7.8	5.3	4.3
65 and over	16.4	16.8	18.6	11.1	16.7	11.6	18.6	19.1	17.0
15 and over	13.0	4.8	5.3	5.5	5.2	2.3	14.0	7.2	7.4
Females -									
15-24	18.8	12.3	5.6	23.0	18.5	19.9	49.8	21.1	10.7
25-44	11.9	9.9	4.7	21.2	22.3	21.0	15.8	24.2	12.8
45-64	30.9	17.8	5.8	18.4	23.0	22.1	20.4	17.8	13.8
65 and over	31.5	46.9	24.0	29.0	29.0	20.7	33.0	20.3	22.4
15 and over	15.7	11.0	5.1	20.2	21.3	19.2	31.0	18.9	12.1

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mere one per cent. Indeed for all urban married males below the age of 65, there are only small differences from province to province in labour force tendencies. At the other extreme, exhibiting very considerable interprovincial variation, are the older (65 years and over) widowed and divorced males living in rural areas. The relative deviation indexes are generally high for the male population of 65 years and over, whatever their marital status or residence characteristics.¹ Another point to be noted from Table 5 is that, for the most part, there is relatively little interprovincial variation in the participation of the married male population (under 65) whether living in rural or urban areas. More variation is exhibited by the other two marital status groups, even in the urban areas.

In sum, then, Table 5 demonstrates in more detail what has already become apparent from the earlier exposition, that although there are considerable geographic differences in the labour force participation rates of some segments of the male population, the dominant group of males—urban, married males in the prime age groups—exhibits only minor variation in labour force activity from province to province.

It is evident that there is a substantial degree of geographic variation in the participation rates of females in most of the 36 population segments displayed in Table 5.² Only single women under 65 years of age living in urban areas exhibit relatively modest interprovincial differences in labour force behaviour. Moreover, as the last line of Table 5 shows, the deviation indices for single women in each residence category are substantially lower than are those for married and other females. In general, the greatest degree of geographic variation in labour force activity is found in the widowed and divorced population living in rural areas, although for some specific age groups the indices for married women in these areas are even higher, mainly as a consequence of lower participation rates. It would be tedious and repetitious to describe in detail the contents of Table 5. What is important is that these data confirm what prior analysis has suggested—that wide geographic variation in labour force behaviour is characteristic of the female population as a whole and of most segments of that population. The main exception is seen to be single women (below the age of 65) living in urban areas.

¹ Note, however, the effect on the relative measure of the higher participation rates of older males living in rural-farm areas.

² For many of these categories the participation rate is very low so that the relative measures of deviation assume very high magnitudes. For this reason it would be wrong to attach too much significance to actual levels or to precise comparisons of magnitude. Concern here is with very broad comparisons of variation and for this purpose the relative measures are not misleading. The reader may wish to compare the two measurements given in Table 5 to see the (implicit) effect of participation rate levels on the relative measures.

3. *Standardization of Provincial Participation Rates*

In Section 2 an attempt was made to expose the extent of interprovincial variation in labour force behaviour by isolating a number of specific population segments for which participation rates differ significantly. The variation in the over-all proportion of provincial populations with labour force attachment reflects both these differences in labour force tendencies or propensities, revealed in the preceding section, as well as the differing population "mixes" across the country. Even if the tendency to participate in the labour force were identical in each province, the over-all participation rates would differ from province to province so long as the composition of population in each province was not identical. By "standardizing" the provincial population—i.e., by reweighting the over-all participation rate in each province by a standard composition¹ instead of its own—one is able to reduce the effect of compositional differences on the total participation rate and examine the extent of interprovincial variation in over-all labour force membership.²

In Table 6, one may observe the effects of standardization on interprovincial variation in participation rates by comparing the indices of absolute and relative deviation of the reweighted provincial rates with those of the actual rates. As may be seen, standardization by age alone has only a small effect on the measures of interprovincial variation, reducing very slightly the absolute and relative indices for males and females. Reweighting for age and sex combined (see column 12) has a somewhat larger although still not a very substantial effect, reducing the relative index from 6.7 to 5.7 per cent. This involves a 15-per cent reduction in the male (age alone) and a negligible 2-per cent decline in the female (age alone) measures of deviation.

¹ In this case the standard is the all-Canada weight. Using a different standard, say, Ontario or another province, would yield not only different rates but possibly also different relationships among these rates. However, concern is with measures of variation and not with specific comparisons and it is doubtful whether the use of another standard would substantially affect the measure of average deviation.

² Theoretically, given the population cross-classified in enough detail—i.e., by all the relevant demographic characteristics that are associated with labour force activity—it would be possible to eliminate statistically the effect of differences in population composition and isolate the propensity differences—on the assumption, which is at least questionable, that the propensity to participate is independent of population composition at any given time.

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Table 6 - Average Deviation of Provincial Participation Rates from Canada Rate, Actual and Standardized,^a 1961

Item	Actual	Standardized on basis of -			
		Age	Age and marital status	Age and residence	Age, marital status and residence
Average absolute deviation ... Average percentage deviation ..	Males				
	(1)	(2)	(3)	(4)	(5)
	3.6	3.2	3.2	2.2	2.3
	4.6	4.1	4.1	2.8	2.9
	Females				
	(6)	(7)	(8)	(9)	(10)
	3.8	3.7	4.2	2.8	3.4
	12.8	12.5	14.1	9.4	11.4
	Both sexes				
	(11)	(12)	(13)	(14)	(15)
	3.6	3.1	3.1	2.5	2.8
	6.7	5.7	5.7	4.6	5.1

^a Standardized on basis of Canada population weights: Age - 11 groups for each sex; Age and marital status - seven age groups and three marital status groups for each sex; Age and residence - seven age groups and three residence groups for each sex; Age, marital status and residence - four age groups, three marital status groups and three residence groups for each sex.

When the provincial participation rates are standardized by age and marital status (and, in the case of both sexes, by sex as well) the effects on interprovincial variation are observed in columns 3, 8 and 13. In the case of males, the addition of marital status makes no difference at all; both the absolute and relative measures of deviation are the same as when age only is taken into account. Similarly, for both sexes combined, the reweighting by age, sex and marital status produces the same result as standardization by age and sex only. For females, however, reweighting the provincial rate by the all-Canada distribution of the population by age and marital status *increases* the measures of interprovincial variation. Thus the differences among the provinces in female labour force propensities are *greater* than the actual measures of deviation (column 6) reveal, being "offset" to some extent by the differing composition of the provincial populations in respect to the marital status of women. (Note, however, that this effect is reversed when residence is also taken into account.)

As may be observed from columns 4, 9 and 14, much larger effects of standardization on the measures of interprovincial variation in participation

STANDARDIZATION OF PROVINCIAL PARTICIPATION RATES

are observed when the provincial rates are standardized for age (sex) and residence. In each case (males, females and both sexes combined) the extent of variation is reduced but the reduction is most marked for males, being in the order of a nearly 40-per cent decline in each measure of deviation. Thus the effect of standardizing the provincial populations by age and residence is to reduce the already small degree of interprovincial variation in the over-all male participation rates to virtually negligible proportions.

Almost the same effect is observed when the male rates are standardized by age, marital status and residence combined (column 5). It is clear from this analysis that there are only minor differences among the provinces in the "propensity" of the male population as a whole to participate in the labour force. Further, a substantial portion of the "observed" variation in provincial labour force rates of males stems from differences in the population "mix" of the provinces, particularly differences relating to rural-urban residence.

The above conclusion certainly does not hold true for females. As is shown in column 11, the effect of standardizing the provincial rates for women by the maximum number of component groups in the population is to expose a somewhat reduced but still substantial (compared to males) amount of interprovincial variation in the labour force behaviour of the female population as a whole. Thus a good deal of the "observed" variation in provincial participation rates of women apparently derives from variation in behaviour and not from demographic structural differences. It must, of course, be stressed again that data limitations preclude full examination of all the relevant "structural" variables and perhaps a more detailed and comprehensive analysis would reduce the extent of variation attributable to behavioural differences.

4. *The Historical Picture: 1911 to 1961*

The preceding portion of this Study has dealt with an exposition of the extent of interprovincial variation in labour force participation at a given point in time, at the time of the 1961 Census. Have interprovincial differences in labour force membership changed over the past few decades? Has there been a marked tendency to convergence in these rates such as has been observed in connection with the American states?¹ This section deals briefly with historical developments from 1911 to 1961.

INTERPROVINCIAL VARIATION IN PARTICIPATION RATES: 1911 TO 1961

In Table 7 the absolute and relative measures of deviation for nine provinces are presented for each census year from 1911 to 1961. It may be observed that provincial participation rates for males, females and both sexes combined were more uniform in 1961 than in 1911, but there has been no steady decline in variation over these five decades. For males, a marked reduction was observed between 1911 and 1921; the relative index fell by almost four fifths over the decade. But no further decline in the extent of interprovincial variation in male labour force participation has taken place; indeed, between 1931 and 1941 the index more than doubled² and, after a decline in 1951, increased again over the last decade.

The geographic differences in the labour force participation of women showed very little tendency to narrow over most of this fifty-year period. A small contraction in relative variation took place between 1911 and 1921—nothing nearly so dramatic as occurred for males—followed by increasing divergence in 1931 and 1941. Only in the past two decades has there been a consistent and fairly substantial narrowing of interprovincial differences in female labour force participation. It should be observed that the convergence of these rates was entirely attributable to the rise of the over-all female participation rate since the absolute measure of deviation has shown no decline over this period.

¹ Simon Kuznets, Ann Ratner Miller and Richard A. Easterlin, *op. cit.*, pp. 7-35.

² See, however, footnote 2, p. 19.

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Table 7 – Average Deviation of Provincial Participation Rates
from Canada Rates,^a 1911-1961

Sex and item	1911	1921	1931	1941 ^b	1951	1961
Actual						
Males –						
Average absolute deviation	4.2	1.0	1.2	2.6	1.9	2.6
Average percentage deviation ..	5.2	1.2	1.4	3.4	2.3	3.3
Females –						
Average absolute deviation	2.0	2.2	2.5	3.0	3.0	3.0
Average percentage deviation ..	13.7	12.7	13.1	14.8	12.6	10.1
Both sexes –						
Average absolute deviation	5.7	2.1	1.8	1.8	1.9	2.7
Average percentage deviation ..	11.6	4.0	3.6	3.6	3.6	5.1
Standardized ^c						
Males –						
Average absolute deviation	1.2	1.2	1.1	2.3	1.2	2.1
Average percentage deviation ..	1.5	1.4	1.3	3.0	1.4	2.7
Females –						
Average absolute deviation	1.9	2.2	2.5	3.1	3.0	2.9
Average percentage deviation ..	13.0	12.7	13.1	15.3	12.6	9.7
Both sexes –						
Average absolute deviation	0.8	1.0	0.7	2.4	1.8	2.2
Average percentage deviation ..	1.6	1.9	1.4	4.9	3.5	4.1

^a Excluding Newfoundland. ^b Excluding armed services. ^c On basis of Canada population weights by age as follows: 1911 – 10-14, 15-24, 25-64, 65 and over; 1921-1951 – 14-19, 20-24, 25-34, 35-64, 65 and over; and 1961 – 15-19, 20-24, 25-34, 35-64, 65 and over.

How much of the observed variation in over-all participation was attributable to interprovincial differences in population mix at each census date? In Table 7, the measures of deviation have been calculated from provincial participation rates standardized by age (Canada weights).¹ The most striking effects of standardization are seen in 1911; the geographic variation in male participation was very sharply reduced as was, to an even greater degree, that for both sexes combined. It is clear that in 1911 the major reason for the wide variation in male rates was the "peculiarity" of

¹ It was not possible to standardize on any more elaborate basis since only age-specific participation rates are available for the years prior to 1951. Moreover, for 1911 there are only very broad age categories (10-14; 15-24; 65+). From 1921 to 1951, the rates were standardized on an identical age basis (14-19; 20-24; 25-34; 35-64; 65+), although it would have been possible to use a more detailed classification for later years. In 1961, the same breakdown was used, except that 14-year-olds were excluded.

the age composition of the male population in some of the provinces. In particular, the Maritime Provinces had relatively high proportions of their male population in the 10-14 age group, the effect of which was to lower the over-all participation rates, and the populations of the western provinces were characterized by the opposite condition, i.e., a very low proportion of youngsters, which acted to raise their over-all participation rates. Even more extreme were the differences in sex ratio between the older, settled, provinces of the country and the western "frontier". The effect of the much higher proportions of males in the west was to raise substantially the proportion of total population in the labour force. Thus, when both age and sex differences in provincial populations are taken into account, the effect of standardization on the variation of total participation rates in 1911 is to reduce both the absolute and relative measures of variation drastically, to a fraction of their "observed" level.

It is only in 1911, however, that the effect of standardization on the measures of interprovincial variations in participation is so marked. In a young, newly settled country, especially one as vast as Canada, differences in demographic composition are likely to be marked.¹ Moving forward in time, however, such differences lessen considerably and thus, as may be seen from the upper and lower portion of Table 7, the effects of standardization on the extent of interprovincial variation of participation are not nearly so dramatic as in 1911. Standardizing by age hardly changes the measures of variation for either males or females after 1911. However, interprovincial differences in sex ratios of the population were more persistent; standardization by age and sex reduces the measures of variation in total participation by more than half in 1921 and 1931 and raises it somewhat in 1941.

It was noted, from observation of the "raw" data in Table 7, that there has been no marked trend toward "convergence" in male participation rates in the Canadian provinces over the past five decades. This is now more readily apparent; the extent of interprovincial variation in the standardized participation rates of males was slightly greater in 1961 than in the earlier part of the century and, indeed, greater than at any of the six census dates except 1941.² The rise in the deviation measures between 1951 and 1961 appears to reflect a "real" increase in interprovincial variation in the labour force behaviour of males unless, of course, it is attributable to the

¹ It would be interesting to push these comparisons back further in time but since Saskatchewan and Alberta were not yet established as provinces in 1901 and because of other severe data limitations it was not possible to begin the analysis any earlier than 1911.

² The measures contained in Table 7 were calculated from labour force data which excluded the armed services and this, in fact, accounts for the relatively high variation in 1941. The corresponding measures for the male labour force including the armed services in 1941 were 0.8 per cent and 1.5 per cent.

PROVINCIAL DIFFERENCES IN LABOUR FORCE PARTICIPATION

effects of differences in population composition in respect to characteristics other than age. In order to test this, the 1951 and 1961 provincial participation rates were standardized by age and residence¹ and it was found that both the absolute and relative deviation measures (including Newfoundland in both years), based on the standardized rates for males, increased over the decade.²

Finally it should be noted that for females, as Table 7 shows, there has been some tendency to convergence of over-all provincial participation rates although the decline in variation seems due almost entirely to the marked growth over this fifty year period in female labour force membership.

It is of some interest to look briefly at the trend in variation of age-specific female participation rates. In Table 8, the deviation measures are presented for five age categories for the period 1921 to 1961 (this age detail is not available for 1911). It is clear from Table 8 that the decline in the relative measure of interprovincial variation of female labour force participation noted above for the over-all rates is characteristic of each of the age-specific rates as well and, further, it seems to be attributable more to a rise in participation rather than to a decline in the absolute deviation.

¹ The 1951 weights were used. Labour force data cross-classified by age and marital status were not available in 1951.

² The absolute measures were 1.4 and 2.2 for 1951 and 1961 respectively; the corresponding relative measures were 1.6 per cent and 2.8 per cent. Another test was also applied to see whether the increase in variation was attributable to demographic or behavioural change. The 1951 rates were standardized on the basis of the 1961 age sex-residence population composition and again a small rise in the deviation measures was observed.

Table 8 - Average Deviation of Female Provincial^a Participation Rates from Canada Rates,^a by Age, 1921-1961

Item	Year	Age groups				
		14-19	20-24	25-34	35-64	65 and over
Average absolute deviation ...	1921	4.2	3.7	2.4	1.4	0.9
Average percentage deviation ..		17.6	10.6	13.9	13.1	14.5
Average absolute deviation ...	1931	3.8	5.3	3.2	1.7	0.6
Average percentage deviation ..		17.7	12.5	14.7	14.2	9.7
Average absolute deviation ...	1941 ^b	4.4	4.0	3.5	2.5	0.5
Average percentage deviation ..		20.2	9.6	14.1	18.2	9.1
Average absolute deviation ...	1951	5.1	4.3	3.6	3.0	0.7
Average percentage deviation ..		16.1	9.1	14.7	15.2	13.5
Average absolute deviation ...	1961	4.0	3.9	3.5	3.8	0.9
Average percentage deviation ..		11.6	7.8	11.7	12.4	13.3

^a Excluding Newfoundland.

^b Excluding armed services.

The most marked decline in relative variation appears to have occurred among women in the younger age group—below 35 years—and most of this convergence in participation rates took place over the most recent decade—between 1951 and 1961. (This tendency to convergence of female participation during the latest intercensal decade contrasts with the rise in variation observed for males over this same period.) The smallest decline in the relative measure is observed for the group of women aged 35-64, the vast majority of whom are married. It should be noted that this is the only group for which the absolute measure of variation showed a consistent increase over the entire period, a development that moderated the fall in relative variation.

Finally, Table 9 presents the absolute and relative measures of deviation, for male and female provincial participation rates by marital status and by residence for 1951 and 1961 (including Newfoundland).

**Table 9 – Average Deviation of Provincial Participation Rates,
from Canada Rates, by Sex and by Marital Status
and Residence, 1951 and 1961**

Sex and item	Marital status					
	Single		Married		Widowed and divorced	
	1951	1961	1951	1961	1951	1961
Males –						
Average absolute deviation	2.5	4.5	1.8	3.2	2.6	3.5
Average percentage deviation ..	3.2	7.1	2.0	3.7	5.5	8.9
Females –						
Average absolute deviation	6.1	5.3	3.1	4.8	3.8	4.2
Average percentage deviation ..	10.4	9.7	27.7	21.8	19.6	18.2
	Residence					
	Rural farm		Rural non-farm		Urban	
	1951	1961	1951	1961	1951	1961
Males –						
Average absolute deviation	3.1	6.5	2.6	3.3	2.3	2.6
Average percentage deviation ..	3.5	7.9	3.3	4.7	2.7	3.3
Females –						
Average absolute deviation	1.0	2.8	1.8	1.9	2.3	2.8
Average percentage deviation ..	9.5	12.7	11.2	9.6	7.8	8.5

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Over this decade there appears to have been some increase in inter-provincial variation in male labour force participation in each of the six categories; i.e., the tendency toward "divergence" noted above has not been confined to a particular group in the male population. On the other hand, the "convergence" of female rates does not appear to have been quite so general. A decline in relative variation may be observed for each of the marital status groups, although in the case of married and widowed and divorced women it was due entirely to a rise in participation over the decade. Among the three residence categories, only the rural non-farm group exhibited some small decline in the extent of interprovincial variation in labour force participation.

In sum, it appears that there has been no marked tendency to convergence of provincial participation rates in Canada over this century. If one considers a relative measure of deviation, female rates in 1961 were a little more uniform across the country than in earlier decades primarily as a consequence of a rise in female labour force membership over these years. Male rates, on the other hand, appear to have diverged somewhat over the most recent intercensal decade.

RANKING OF PROVINCIAL PARTICIPATION RATES: 1911 TO 1961

So far, the interprovincial "structure" of participation rates has been considered from one viewpoint only—the extent of variation or dispersion of these rates. That is, indeed, the main focus of this Study. But before concluding the discussion the reader may find interesting a brief consideration of the ranking of these rates, and whether or not this ranking has changed over time.

Section A of Table 10 presents the provincial participation rates, by sex, and their rank (highest to lowest) in 1961; Section B provides the same information for these rates standardized for the maximum demographic detail. It may be seen, from Section A, that *male* rates are above-average in Ontario and the Prairies and below-average in Quebec, British Columbia and the Atlantic Region. Standardization does not affect this pattern materially except for the fact that Prince Edward Island moves into the above-average group. Standardization does, however, bring up some of the very low rates (this is most marked in the cases of Newfoundland and New Brunswick) and pull down some of the higher ones, thereby reducing the dispersion—an effect already noted.

Table 10 - Provincial Participation Rates, Actual and Standardized, by Sex, 1961

(Ranked from highest to lowest)

Province	Participation rate and rank					
	Males	Rank	Females	Rank	Both sexes	Rank
(A) Actual rates						
Canada	78.1		29.7		54.0	
Ontario	81.1	1	32.9	1	56.9	2
Alberta	80.9	2	31.0	3	57.0	1
Manitoba	78.4	3	31.7	2	55.3	3
Saskatchewan	78.3	4	26.6	6	53.5	4
Quebec	77.3	5	28.1	5	52.5	5
Prince Edward Island ...	76.5	6	24.9	8	51.3	7
British Columbia	74.5	7	28.6	4	51.9	6
Nova Scotia	74.0	8	24.8	9	49.7	8
New Brunswick	71.6	9	25.1	7	48.5	9
Newfoundland	65.3	10	18.6	10	42.7	10
(B) Standardized rates ^a						
Ontario	79.6	1	33.1	1	56.5	1
Alberta	79.5	2	32.6	3	56.2	2
Saskatchewan	78.7	3	31.2	4	55.1	4
Manitoba	78.5	4½	32.9	2	55.8	3
Prince Edward Island ...	78.5	4½	29.4	6	54.1	5
Quebec	76.4	6	24.1	9	50.4	9
British Columbia	76.3	7	30.1	5	53.3	6
Nova Scotia	76.1	8	25.9	8	51.1	7
New Brunswick	74.4	9	26.9	7	50.8	8
Newfoundland	69.1	10	19.7	10	44.5	10

^a By age (sex), residence and marital status on the basis of the Canada population composition: four age groups, three residence groups and three marital status groups for each sex.

The ranking of *female* rates is not very different from that observed for males.¹ Ontario, Alberta and Manitoba are "high-participation" provinces. Standardization has a more dramatic effect on female rates than on male rates and consequently produces more "reshuffling" of ranks.² The most noteworthy example of change in rank is that for Quebec. The actual participation rate for females in Quebec is fifth highest among the provinces; the effect of standardization is to reduce this rate by four percentage

¹ The Spearman correlation coefficient (ranking of male versus female rates) was .80.

² The sum (disregarding sign) of the changes in rank effected by standardization is 5 for males, 10 for females.

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points, bringing it down to second lowest place among the provincial rates.¹

Finally, looking at the over-all participation rates (both sexes combined) in Section A of Table 10, it may be seen once more that labour force membership is highest in Ontario, Alberta and Manitoba and lowest in the three Atlantic Provinces—Nova Scotia, New Brunswick and Newfoundland. Again, however, Quebec's rank drops from 5 to 9 as a consequence of standardization.

How persistent are these patterns of participation? In Table 11, rank correlation coefficients are presented for selected years. These data (row 1) suggest that over the entire period there has been a considerable shifting about of the male participation rates with the consequence that there is no significant association between the rank of these provincial rates at the beginning and the end of the period (1911 and 1961). As may be seen by the relatively low values of the coefficient for 1931:1941 and 1941:1951 (the coefficient for the former pair of years is not significant and that for the latter is barely so),² the war period appears to have had a particularly disruptive effect on the interprovincial "structure" of male participation.³

The interprovincial pattern of female participation rates appears to have been somewhat more stable than that of males, as is evident from the rank correlation coefficients in Table 11, all of which (with the exception of the 1911:1961 pair) are significant and relatively high. However, there has been more and more shifting of ranks in the last two decades so that by 1961 the pattern of provincial participation rates for women bore no marked resemblance to that prevailing in 1911. It is, none the less, of some interest that the coefficient of rank correlation for female participation rates by province in 1911 and 1961, while not quite significant at the five per cent level, was considerably higher than that for males— $.60$ as compared with $.28$. This confirms the impression of greater stability in the pattern of female as compared with male rates over this half-century period.

¹ The proportion of the female population which is married is lower in Quebec than in any other province. This demographic "peculiarity" accounts for the strong effect of standardization.

² The critical t value (5-per cent level) for $n=9$ is 2.262 and the t value for a Spearman coefficient of $.650000$ is 2.263010.

³ The participation rates used in this calculation exclude the armed services. The corresponding coefficients based on rates including the armed services were: 1931:1941— $.47$; 1941:1951— $.67$. Hence the observation about the effects of the war would not be altered if the labour force had included the armed services.

Table 11 – Rank Correlation Coefficients,^a Provincial^b Labour Force Participation Rates, 1911-1961

Rates ranked	Years ranked					
	1911: 1921	1921: 1931	1931: 1941	1941: 1951	1951: 1961	1911: 1961
(1) Males	<u>.88</u>	<u>.72</u>	.52	<u>.65</u>	<u>.77</u>	.28
(2) Females	<u>.87</u>	<u>.92</u>	<u>.95</u>	<u>.80</u>	<u>.76</u>	.60
	1911	1921	1931	1941	1951	1961
(3) Males:Females08	-.50	-.52	-.10	.49	<u>.80</u>

^a Spearman co-efficients. Those underlined are significant at the 5-per cent level.^b Excluding Newfoundland.

Row 3 of Table 11 presents the rank correlation coefficients for male versus female participation rates by province for each census year from 1911 to 1961. Only in the latest year—1961—are the ranks significantly related, and the relationship is relatively strong and positive. Thus, at the present time, in provinces with high male participation, female participation tends to be high and vice versa. But clearly this phenomenon represents a change from earlier circumstances. In earlier years there was no significant association between the ranks of male and female participation rates by province. Further, in three of the five earlier years, the association (though not statistically significant) was negative. Hence in the past decade the situation has changed from one in which there was a very weak, sometimes negative, association between the labour force activity of males and females within a province to one characterized by a relatively strong and positive association in this particular sphere.

5. Conclusion

This Study has sought to expose the extent of interprovincial variation in labour force participation and to determine the relative importance of demographic and behavioural differences in "explaining" the variation in participation rates across Canada. Why are rates lower or higher in some provinces than in others? In part, it has been found, because of differences in population composition. But taking into account such demographic differences, variation in labour force behaviour may still be observed from province to province. Such variation is much more marked for some groups in the population than for others. In every province of Canada almost all prime age married males living in urban centres are in the labour force. (Moreover, although there are no historical statistics available, one suspects that this probably was always so.) However, the situation is different for most women and for other segments of the male population. For these groups the decision to enter or not to enter the labour force is not nearly so autonomous and the degree to which such groups do, in fact, form a labour force attachment varies from province to province at any given time. An analysis of the factors that influence these decisions, of course, leads into another territory, beyond the scope of this Study.

Appendix

A NOTE ON THE VARIATION OF PARTICIPATION RATES IN CANADA

Regression Analysis

Throughout the foregoing Study it has been assumed, without rigorous demonstration, that participation rates vary according to certain characteristics of individuals—age, sex, marital status—and according to characteristics of their area of residence, whether it be urban or rural, in one part of Canada or another.¹ Standardization for these factors was used, in combination with other simple expository devices, to focus on the extent of geographic variation in participation arising from demographic and “other” influences. The purpose of the analysis in this Appendix is, in a sense, anterior to that of the main Study—to measure the influence of each of the factors cited above on labour force activity rates. The effect of each factor—as well as each category within the factor—is estimated by means of regression analysis and analysis of variance.²

The basic data consisted of average labour force participation rates (for each sex) specific to each combination of the following factor-category cells:—

<i>Factor</i>	<i>Category</i>
Marital status.....	Single, Married, Widowed and Divorced
Age	15-24, 25-44, 45-64, 65 and over
Residence.....	Urban, rural non-farm, rural farm
Region ³	Atlantic, Quebec, Ontario, Prairies, British Columbia.

Thus there were, in all, 180 observations, i.e., three (marital status) x four (age) x three (residence) x five (region).

Regression equations were fitted to these rates using dummy variables.⁴ In addition, separate regressions were run controlling for marital

¹ It is well known, of course, that labour force activity is influenced by many other factors as well as those considered in this Study; their exclusion from the analysis was dictated entirely by reason of data limitations. Further, it should perhaps be noted that the residence factors (type, province or region) are in part, “proxies” for some of these economic, social and cultural influences but, in the absence of available data, it is impossible to distinguish among these effects.

² For the type of regression analysis carried out in this Note, the regression results could have been obtained directly from the analysis of variance output. However, ease of presentation has dictated the form of the present approach. Further methodological exposition is available from N.H.W. Davis, *Special Manpower Studies and Consultation*, Dominion Bureau of Statistics.

³ After testing the data it was decided to use regional rather than provincial breakdowns since there was no significant difference in the explanatory power of the two factors and the regional data had fewer small cells.

⁴ The form of the equation for each sex was:—

$$y = \sum_{i=0}^{15} b_i x_i$$

where y = labour force participation rate

$$x_0 = 1$$

$$x_1 = 1 \text{ if single, } 0 \text{ otherwise}$$

$$x_2 = 1 \text{ if married, } 0 \text{ otherwise}$$

$$x_3 = 1 \text{ if widowed or divorced, } 0 \text{ otherwise}$$

and similarly for each of the remaining 12 factor-category designations.

status.¹ The results are shown in Tables A.1 and A.2. In interpreting these results the reader should note that the constant term is an unweighted mean of the 180 (or, in the case of the separate equations by marital status, of the 60) factor-category-specific participation rates. This, of course, arises from the form of the input data since each participation rate (the dependent variable) has a weight of one.²

A few examples will serve to illustrate the use of Tables A.1 and A.2 then the more important findings may be briefly highlighted. Thus, the estimated participation rate of single males, aged 15-24, living in urban British Columbia is:—

$$67.647 - 8.022 + 7.440 - 1.588 - 0.728 = 64.749.$$

Similarly, the estimated rate for married females, aged 25-44, living in rural non-farm Ontario is:—

$$31.636 - 15.491 + 13.837 - 5.927 + 3.082 = 27.137.$$

It will be observed that (using the standard *t* test) most of the marital status, age and resident categories are significantly different from each other. Not unexpectedly, marital status is a much more important "determinant" of the labour force activity of women than men; for the latter, age exerts a more powerful influence. The regional differences shown in Tables A.1 and A.2 are generally small and some are not significant. However, controlling for marital status (which, it will be noted, increases the coefficients of determination for women much more than for men) reveals significant and not inconsiderable regional differentials for married and for widowed and divorced women—a result which supports the analysis in the preceding text.

Finally, while the signs of the coefficients generally conform to *a priori* expectation, one—that for single women living in Quebec, which is both strong and positive—may, perhaps, occasion surprise. In fact, observation of these and other data shows that the participation rate of single women in Quebec is the highest in Canada, while that for married women is the lowest. Moreover, the rates for immigrant women, both single and married, are higher in Quebec than elsewhere in Canada.

A plausible explanation of these phenomena (and the regression result in this Study) is that in the other provinces the expanding demand for female

¹ Separate equations were run for each marital status category because variance analysis demonstrated that this factor exhibited the largest significant second order interaction for males and females considered together. For males alone, age would have been a more efficient factor for control. (See Table A.2.)

² In other words the input rates—which consist of an average rate for each factory-category cell—have been treated as though they were micro data (single observations). Cf. Glen Cain, *Married Women in the Labour Force* (Chicago, 1966), c. III and references cited therein.

labour in recent years has been largely satisfied by the entry (or re-entry) of married women into the labour force but in Quebec—mainly for cultural reasons—that source of supply has not been available to nearly the same degree. Hence in Quebec a larger portion of the jobs have been filled by other females, i.e., by single (native-born) women and immigrant women. Further, as has already been pointed out in the preceding text, the proportion of the female population which is married is markedly smaller in Quebec than elsewhere in Canada. (This difference in population mix is especially noticeable in the youngest age groups, i.e., the average age at marriage is higher in Quebec.) Thus, the supply of married women in Quebec is relatively restricted not only because the participation rate of married women is very much lower but also because the “population at risk” is smaller relative to that in other provinces.

Analysis of Variance

The results of the analysis of variance are shown in Table A.3. They of course provide the same over-all picture as the regression analysis but permit the examination of the interaction effects and further comment on the relative importance of the factors examined.

Table A.3 shows that most (72 per cent) of the variation in male participation rates can be explained by age differences, somewhat more (9 per cent) by marital status than residence (6.7 per cent), and very little by region (0.7 per cent).¹ The interaction effect between marital status and age and between age and residence each contributed over 4 per cent to the total sum of squares, again underlining the importance of age as a factor influencing male labour force activity.

For females, no single factor is as important as was age in the case of males. However, marital status contributed 38.5 per cent and, through interaction effects with the other factors (especially age), a further 13.7 per cent to the total sum of squares. It should be noted that region was much more important for females than for males.

Transformed Data

Because it seemed a reasonable assumption that the separate influence of each of the different factors is not necessarily additive, particularly at the low and high ends of the participation rate range, regression

¹ As may be seen from Table A.2, however, region is *just* significant at the five per cent level.

and variance analyses were carried out on log transformation of the dependent variable.¹ A brief summary of the main results will illustrate the effects of the transformation.

From Table A.4 one may compare the contribution to the total sum of squares using transformed and untransformed data. For males, the changes produced were small; the influence of age was reduced at the expense of marital status, although age remains by far the most important "determinant" of male labour force activity. The reduction in the interaction terms was minor. For females, however, the transformation was much more effective in reducing the interaction effects. As Table A.4 shows, the main effects of the four factors together rose markedly – from 77 per cent to 85.6 per cent. It will be noted that this rise was due entirely to an enhanced contribution of age.

In Table A.5 the coefficients of determination derived from the two sets of regressions are presented – again, for purposes of illustrating the effect of transformation.

As already noted, in the case of women the transformation substantially increased the explanatory power of the four factors. But, the coefficients for each of the individual marital status groups did not show a comparable rise. Although those for single women were identical with transformed and untransformed data, there was a considerable improvement in the coefficient for married women. These results suggest that the use of transformation is most effective for groups with a wide range of variation in rates and for which, therefore, the assumption of linearity is least appropriate. The non-linearity of the relationship within such factor groups accounts for the larger interaction effects revealed in the results obtained for untransformed data.

¹ The participation rates were transformed according to the formula:

$$P' = \log_e (P/100 - P)$$

(In the two cases in which the dependent variable had a value equal to 100 – which could not be transformed – the estimated values derived from the regression analysis of untransformed data were used.) This transformation also ensures that estimates derived from the regression equations are constrained to keep within the bounds of the dependent variable. It is evident, for example, that some "negative" participation rates could be obtained from the estimations displayed in Table A.1, for untransformed data.

Table A.1 - Regression Equations for Male Participation Rate Analysis

NOTE. - The standard error of the coefficients for each set of factor coefficients is the standard error of the differences between any two coefficients within the same set.

	Constant = over-all mean	Coefficients of -			
		Marital status	Age	Residence	Region
TOTAL					
$R^2 = .8834$ $N = 180$	67.647	Single - 8.022 Married + 10.983 Widowed and divorced - 2.961	15-24 + 7.440 25-44 + 19.800 45-64 + 11.357 65 and over ... - 38.597	Urban - 1.588 Rural non-farm .. - 7.562 Rural farm + 9.151	Atlantic - 3.034 Quebec - 1.329 Ontario + 2.844 Prairies + 2.247 British Columbia - 0.728
(Standard Error of Coefficients)		(1.7283)	(1.9957)	(1.7283)	(2.2313)
SINGLE					
$R^2 = .9163$ $N = 60$	59.625		15-24 - 4.711 25-44 + 23.526 45-64 + 12.445 65 and over ... - 31.260	Urban - 3.231 Rural non-farm .. - 7.335 Rural farm + 10.566	Atlantic - 5.814 Quebec - 0.670 Ontario + 3.439 Prairies + 3.459 British Columbia - 0.413
(Standard Error of Coefficients)			(2.6684)	(2.3109)	(2.5836)
MARRIED					
$R^2 = .8885$ $N = 60$	78.630		15-24 + 13.635 25-44 + 16.043 45-64 + 9.907 65 and over ... - 39.585	Urban - 0.763 Rural non-farm .. - 7.201 Rural farm + 7.963	Atlantic - 2.833 Quebec - 1.340 Ontario + 3.750 Prairies + 1.958 British Columbia - 1.535
(Standard Error of Coefficients)			(3.3874)	(2.9336)	(3.7873)
WIDOWED AND DIVORCED					
$R^2 = .9486$ $N = 60$	64.865		15-24 + 13.396 25-44 + 19.831 45-64 + 11.720 65 and over ... - 44.947	Urban - 0.771 Rural non-farm .. - 8.152 Rural farm + 8.923	Atlantic - 0.456 Quebec - 1.976 Ontario + 1.344 Prairies + 1.325 British Columbia - 0.237
(Standard Error of Coefficients)			(2.5204)	(2.1827)	(2.8179)

Table A.2 – Regression Equations for Female Participation Rate Analysis

NOTE. – The standard error of the coefficients for each set of factor coefficients is the standard error of the differences between any two coefficients within the same set.

	Constant = over-all mean	Coefficients of -			
		Marital status	Age	Residence	Region
TOTAL					
$R^2 = .7667$ $N = 180$	31.636	Single + 11.562 Married - 15.491 Widowed and Divorced ... + 3.929	15-24 + 2.979 25-44 + 13.837 45-64 + 5.855 65 and over... - 22.730	Urban..... + 9.104 Rural non-farm - 5.927 Rural farm..... - 3.177	Atlantic - 4.295 Quebec - 3.954 Ontario + 3.082 Prairies + 2.015 British Columbia..... + 3.153
(Standard Error of Coefficients)		(2.0082)	(2.3189)	(2.0082)	(2.5926)
SINGLE					
$R^2 = .8970$ $N = 60$	43.198		15-24 - 6.299 25-44 + 22.233 45-64 + 10.045 65 and over... - 25.981	Urban..... + 14.371 Rural non-farm .. - 4.405 Rural farm..... - 9.967	Atlantic - 5.093 Quebec + 2.860 Ontario - 0.040 Prairies + 0.591 British Columbia..... + 1.681
(Standard Error of Coefficients)			(2.8541)	(2.4717)	(3.1910)
MARRIED					
$R^2 = .8690$ $N = 60$	16.145		15-24 + 4.196 25-44 + 3.732 45-64 + 4.377 65 and over... - 12.304	Urban..... + 4.350 Rural non-farm .. - 3.650 Rural farm..... - 0.700	Atlantic - 3.495 Quebec - 4.910 Ontario + 4.672 Prairies + 2.474 British Columbia..... + 1.259
(Standard Error of Coefficients)			(1.3413)	(1.1616)	(1.4996)
WIDOWED AND DIVORCED					
$R^2 = .8458$ $N = 60$	35.565		15-24 + 11.038 25-44 + 15.545 45-64 + 3.142 65 and over... - 29.726	Urban..... + 8.591 Rural non-farm .. - 9.727 Rural farm..... + 1.136	Atlantic - 4.298 Quebec - 9.813 Ontario + 4.612 Prairies + 2.979 British Columbia..... + 6.519
(Standard Error of Coefficients)			(3.4511)	(2.9887)	(3.8584)

Table A.3 - Analysis of Variance of Participation Rates

Sex and item	Sum of squares		Degrees of freedom	Mean squares	Variance ratios	
	Sum	Per cent of total			a	b
Males -						
Main Effects -						
Marital status	11,624.3	9.00	2	5812.1	240.2	64.9
Age	92,977.4	71.99	3	30992.5	1280.7	345.9
Residence	8,606.9	6.66	2	4303.5	177.8	48.0
Region	886.9	.69	4	221.7	9.2	2.5
Second Order Interactions -						
Marital status/age	5,220.0	4.04	6	870.0	36.0	
Marital status/residence	160.9	.12	4	40.2	1.7	
Marital status/region	265.1	.21	8	33.1	1.4	
Age/residence	5,499.0	4.26	6	916.5	37.9	
Age/region	383.2	.30	12	31.9	1.3	
Residence/region	526.6	.41	8	65.8	2.7	
Third Order and Fourth Order Interactions	3,000.0	2.32	124	24.2	1.0	
Totals, Males	129,150.3	100.00	179			
Females -						
Main Effects -						
Marital status	23,641.4	26.97	2	11820.7	317.8	98.3
Age	33,764.1	38.52	3	11254.7	302.5	93.6
Residence	7,908.2	9.02	2	3954.1	106.3	32.9
Region	2,156.7	2.46	4	539.2	14.5	4.5
Second Order Interactions -						
Marital status/age	7,629.0	8.70	6	1271.5	34.2	
Marital status/residence	3,002.0	3.42	4	750.5	20.2	
Marital status/region	1,383.6	1.58	8	172.9	4.6	
Age/residence	2,111.4	2.41	6	351.9	9.5	
Age/region	803.5	.92	12	67.0	1.8	
Residence/region	645.4	.74	8	80.7	2.2	
Third Order and Fourth Order Interactions	4,617.1	5.27	124	37.2	1.0	
Totals, Females	87,662.4	100.00	179			

^a Mean squares of main effects and second order interactions divided by mean square of third order and fourth order interactions combined.

^b Mean squares of main effects divided by mean square of all interactions combined.

**Table A.4 – Percentoge Contribution to Total Sum of Squares –
Transformed and Untransformed Data**

Item	Males		Females	
	Without transformation	With transformation	Without transformation	With transformation
	%	%	%	%
Main Effects –				
Marital status	9.0	16.3	27.0	25.2
Age	72.0	64.7	38.5	51.0
Residence	6.7	7.0	9.0	6.8
Region	0.7	1.8	2.5	2.6
	(88.4) ^a	(89.8) ^a	(77.0) ^a	(85.6) ^a
Second Order Interactions –				
Marital status/age	4.0	3.5	8.7	4.5
Marital status/residence	0.1	0.3	3.4	2.1
Age/residence	4.3	3.4	2.4	1.6
Other	0.9	1.5	3.2	2.4
Third and Fourth Order Interactions	2.3	1.4	5.3	3.8
Totals	100.0	100.0	100.0	100.0

^a Percentage of total sum of squares due to four factors: equal (subject to minor differences arising from arithmetic calculation) to coefficient of determination.

**Table A.5 – Coefficients of Determination –
Transformed and Untransformed Data**

Item	Males		Females	
	Without transformation	With transformation	Without transformation	With transformation
Total883	.898	.767	.852
Single916	.910	.897	.897
Married889	.924	.869	.945
Widowed and divorced949	.944	.846	.911



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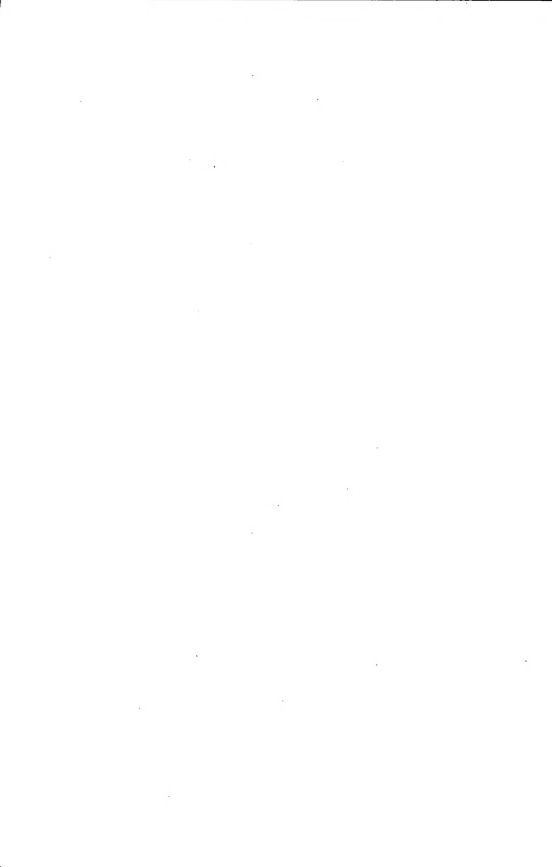
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